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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/680,943	10/10/2000	Hidenori Kamei	43890-449	4504

7590

01/16/2002

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EXAMINER

COLLINS, DEVEN M

ART UNIT

PAPER NUMBER

2823

DATE MAILED: 01/16/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/680,943

Applicant(s)

KAMEI ET AL.

Examiner

D. M. Collins

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 December 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) 11 and 12 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 1.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

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DETAILED ACTION

Election/Restriction

1. Applicant's election without traverse of Group I, claims 1-10 in Paper No. 7 is acknowledged.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

3. Claims 1-10 are rejected under 35 U.S.C. 102(e) as being unpatentable over Orita et al. (6,117,700, dated 9/12/00).

Orita et al. show the method as claimed in the Figures 1-10 with corresponding text. In re claim 1, Orita et al. disclose a method for manufacturing p-type nitride semiconductor (figs. 2, 9) comprising:

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a semiconductor layer forming process for forming a low resistivity p-type nitride semiconductor layer 17b on a substrate 20 held at a temperature of 600°C or higher by introducing p-type dopant source Mg, nitrogen source and Group III source on said substrate 20, and

a cooling process for cooling the substrate 20 bearing said p-type nitride semiconductor layer 17b;

wherein the hole carrier concentration of said p-type nitride semiconductor layer 17b decreases during said cooling process.

In re claim 2, Orita et al. disclose the method for manufacturing p-type nitride semiconductor (figs. 2, 9) recited in claim 1, wherein the decrease rate of said hole carrier concentration is 0%-95%.

In re claim 3, Orita et al. disclose the method for manufacturing p-type nitride semiconductor (figs. 2, 9) recited in claim 1 or claim 2, wherein said cooling process contains a procedure during which the substrate 20 is cooled from the substrate temperature in said semiconductor layer forming process to 600°C within 30 min.

In re claim 4, Orita et al. disclose the method for manufacturing p-type nitride semiconductor (figs. 2, 9) recited in claim 1, 2 or 3, wherein the atmosphere in said semiconductor layer forming process contains hydrogen for 5% - 70% in capacity percent.

In re claim 5, Orita et al. disclose the method for manufacturing p-type nitride semiconductor (figs. 2, 9) recited in claim 1, 2, or 3, wherein the atmosphere introduced during a procedure, in said cooling process, for cooling a substrate 20 from substrate temperature in said semiconductor layer forming process to 600°C contains hydrogen for 0%--50% in capacity percent.

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In re claim 6, Orita et al. disclose the method for manufacturing p-type nitride semiconductor (figs. 2, 9) recited in claim 1, 2, or 3, wherein the atmosphere introduced during a procedure, in said cooling process, for cooling a substrate 20 from said substrate temperature in said semiconductor layer forming process to 600°C contains ammonia, NH₃.

In re claim 7, Orita et al. disclose a method for manufacturing p-type nitride semiconductor (figs. 2, 9) comprising:

a p-type nitride semiconductor layer 17b forming process for forming a low resistivity p-type nitride semiconductor layer on a substrate 20 held at a temperature of approximately 950°C or higher by introducing p-type dopant source Mg, nitrogen source and Group III source on said substrate, and

a cooling process for cooling the substrate bearing said p-type nitride semiconductor layer;

wherein said substrate 20 is cooled during a procedure, in said cooling process, for cooling said substrate 20 from approximately 950°C to approximately 700°C, under certain specific combinations of the hydrogen concentration in atmosphere and the cooling time where the p-type nitride semiconductor layer can maintain the low resistivity property.

In re claim 8, Orita et al. disclose the method for manufacturing p-type nitride semiconductor (figs. 2, 9) recited in claim 7, wherein the combination of said hydrogen concentration in atmosphere and said cooling time falls within a region specified by points A - B - C - D - E - F, in an X - Y coordinate, X axis representing said hydrogen concentration (%) in atmosphere, Y axis representing said cooling time (min.); where, the point A(50, 1. 0), point B(30, 1. 8), point C(10, 4. 1), point D(0.

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15), point E(0, 0. 5) and point F(50, 0. 5).

In re claim 9, Orita et al. disclose a method for manufacturing p-type nitride semiconductor (figs. 2, 9) comprising:

a p-type nitride semiconductor layer 17b forming process for forming a low resistivity p-type nitride semiconductor layer on a substrate held at a temperature of approximately 950°C or higher by introducing p-type dopant source Mg, nitrogen source and Group III source on said substrate 20, and

a cooling process for cooling the substrate bearing said p-type nitride semiconductor layer;

wherein said substrate 20 is cooled at the vicinity of approximately 800°C, in said cooling process, under certain combinations of the hydrogen 21 concentration in atmosphere and the cooling rate, where the p-type nitride semiconductor layer can maintain the low resistivity property.

In re claim 10, Orita et al. disclose the method for manufacturing p-type nitride semiconductor (figs. 2, 9) recited in claim 9, wherein the combination of said hydrogen 21 concentration in atmosphere and said cooling rate falls within a region specified by points O - P - Q - R - S - T, in an X - Y coordinate, X axis representing said hydrogen concentration (%) in atmosphere, Y axis representing said cooling rate (°C/ min.); where, the point O(50, 250), point P(30, 140), point (x(10, 61), point R(0. 17), point S(0, 500) and point T(50, 500).

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Conclusion

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

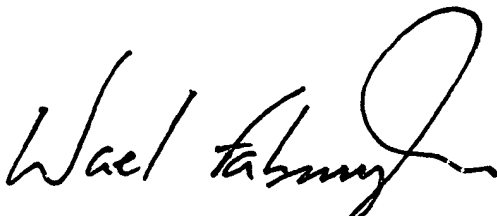
5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Deven M. Collins whose telephone number is (703) 305-7840. The examiner can normally be reached on Monday-Friday from 6:30 AM to 3:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M. Fahmy, can be reached on (703) 308-4918. The fax phone number for this Group is (703) 305-3432.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956.

DMC

January 14, 2002


SUPERVISORY PRIMARY EXAMINER
TECHNOLOGY CENTER 2800